spreading factor, and (3) orthogonal frequency division multiplex (OFDM) each of these chips to a different subcarrier frequency, so that the chips are aligned in a frequency axis direction (i.e., frequency diversified). Thereafter, the OFDM chips constituting the known signal are transmitted simultaneously. Another feature of the invention, as defined by independent claims 17-19 and 21, is to: (1) receive an OFDM known-signal of the type described above, (2) detect a residual phase error using the received known signal, and (3) compensate another received signal using the detected residual phase error.

The above-described features provide an advantage of achieving OFDM frequency diversity for components of a known signal. Due to this frequency diversity, residual phase errors may be detected with a high degree of accuracy in a fading environment where some OFDM subcarriers have a low reception level. In other words, although some subcarrier frequencies carrying chips of the OFDM known-signal may experience high levels of intermittent interference (e.g., fading), most subcarrier frequencies will not. As a result, the few incorrectly received chips may be regenerated through an error correction technique so that the known signal may be reconstituted. Once the known signal is reconstituted, it may be used to detect residual phase errors so that information

signals, accompanying the transmitted known-signal, may be better received.

Moreover, the above-noted feature of spreading a known signal in a frequency axis direction provides the advantages of reducing the time for residual phase error detection and the requisite memory capacity at the receiving end, as discussed more fully in Applicant's Response dated June 28, 2005.

By contrast to the above-noted feature, Sunaga discloses spreading a pilot signal in a time axis direction (i.e., <u>time diversity</u>). As noted above, the present invention orthogonally frequency division multiplexes a known signal and spreads the known signal in a frequency axis direction (i.e., <u>frequency diversity</u>). This is achieved by breaking down the known signal into the same number of chips as the spreading factor and assigning each chip to a different subcarrier of the transmitted OFDM signal. Sunaga discloses nothing similar to this, as acknowledged in the Final Rejection (see Final Rejection page 4, second paragraph).

To overcome Sunaga's deficiencies, the Final Rejection proposes that Amitay discloses utilizing a frequency diversity system to transmit a pilot signal within each subcarrier channel (page 4, third paragraph). However, the proposed teaching bears no similarity to the features recited in claims 15 and 18-20 of breaking down a spread known-signal into the same number of chips

as the spreading factor and assigning each chip to a different subcarrier of an OFDM signal.

Amitay discloses, in Fig. 1, transmitting a first pilot frequency f_1 using a first polarization (i.e., channel 1) and transmitting a second pilot frequency f_2 using a second polarization (i.e., channel 2) that is orthogonal to the first polarization (Amitay col. 2, lines 52-67). As illustrated in Fig. 2, Amitay's pilot signals f_1 and f_2 are each sinusoidal signals of a single frequency; they are not spread known-signals nor spread known-signals that have been broken down into a number of spreading chips, as recited in claims 15 and 18-20.

Moreover, Amitay's pilot signals f_1 and f_2 are not assigned to different subcarriers of an OFDM signal, as seemingly proposed in the Final Rejection (see Final Rejection page 4, third paragraph). Instead, Amitay's pilot signals f_1 and f_2 are assigned to mutually orthogonal polarizations of a single frequency band (i.e., a single carrier) (Amitay col. 2, lines 63-67).

In summary, the Final Rejection acknowledges that Sunaga does not teach the features recited in claims 15 and 18-20 of breaking down a spread known-signal into the same number of chips as the spreading factor and assigning each chip to a different subcarrier of an OFDM signal. And Amitay does not supplement the teachings of Sunaga in this respect, for the reasons discussed above.

Accordingly, the Applicant respectfully submits that the applied references do not teach all of the features defined by claims 15 and 18-20. Therefore, allowance of claims 15 and 18-20 and dependent claim 16 is warranted.

Moreover, modifying Sunaga's system so that it transmits a different single-frequency sinusoid (i.e., Amitay's pilot signals) within each of two mutually orthogonal polarizations (i.e., Amitay's channels) of a single modulated carrier (i.e., the type of carrier transmitted by Amitay's system) would not produce the effect proposed in the Final Rejection of transmitting each spreading chip of a pilot signal in a different OFDM subcarrier (see Final Rejection page 4, first sentence of fourth paragraph). Furthermore, the proposed modification would not improve the error recovery capability of Sunaga's RAKE combiners or provide any apparent independent error recovery capability, as proposed in the Final Rejection (see page 4, last sentence of fourth paragraph). Since the proposed modification does not provide any apparent improvement to the error recovery capability of Sunaga's receiver and does not seemingly increase the communication channel capacity in some other way, the Final Rejection fails to support its conclusion that the proposed modification could improve the communication capacity of Sunaga's system.

Accordingly, the combined teachings of the applied references fail to provide a motivation to modify Sunaga's system in the manner proposed in the Final Rejection. Therefore, allowance of claims 15 and 18-20 and all claims dependent therefrom is warranted for this independent reason.

Claims 17-19 and 21 recite: (1) receiving an OFDM known-signal of the type described above for distinguishing claims 15 and 18-20 from the applied references, (2) detecting a residual phase error using the received known-signal, and (3) compensating another received signal using the detected residual phase error. As discussed above, the applied references do not teach an OFDM signal of the type defined in claims 15 and 18-20 or provide motivation to combine their respective teachings. As a result, it necessarily follows that the references cannot suggest using such a signal to detect a residual phase error and compensate another received signal using the detected residual phase error.

Accordingly, the applied references do not teach all of the features defined by claims 17-19 and 21. Therefore, allowance of claims 17-19 and 21 is warranted.

As a final note, the Final Rejection proposes in numerous places that both Sunaga and Amitay teach frequency subcarriers (see Final Rejection page 3, first paragraph, and page 4, first, third and fourth paragraphs). The Applicant respectfully submits that

neither reference discloses or suggests frequency subcarriers. More importantly, neither reference suggests OFDM subcarriers.

In view of the above, it is submitted that this application is in condition for allowance and a notice to that effect is respectfully solicited.

If any issues remain which may best be resolved through a telephone communication, the Examiner is requested to telephone the undersigned at the local Washington, D.C. telephone number listed below.

Respectfully submitted,

Date: December 13, 2005
JEL/DWW/att

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